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MODELING ERROR ESTIMATES FOR PLATE BENDING MODELS BASED ON LOCAL NEUMANN PROBLEM

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ABSTRACT

We present a methodology of a posteriori error estimation and adaptivity for modeling error for the problem of linear elastic plate bending. The basic idea is that for each finite element of the mesh, which is considered satisfying from the standpoint of the discretization error, a sufficiently refined plate bending model is chosen so that the modeling error is distributed nearly uniformly in all regular and disturbed areas of the plate.

We estimate the error in linear elastic plate bending by using implicit residual a posteriori modeling error estimator that is based on the representation of the weak form of the residual that includes equilibrated boundary tractions. The model error estimator is defined in an energy norm from the difference of the internal forces of finer and coarse models. The boundary tractions are approximated by using solution of the coarse model. Solution of the finer model is obtained by solving local element based Neumann problems.

The plate bending models that are considered are: discrete Kirchhoff model, Reissner-Mindlin model, higher order model that takes into account through-the-thickness stretching, and 3d solid model.

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